2. A method as defined in claim 1 in which the mask has a surface relief pattern selected to modulate by approximately $\pi+2\pi n$ radians the phase of the light beam, wherein

$$\frac{4\pi(n_{silica}-1)A}{\lambda}=\pi+2\pi n$$

where A is the amplitude of the surface relief pattern, n=0,1,2,3, λ is the wavelength of the light used for writing (photoinducing) an index change in the optical medium and n_{silica} is the refractive index of the silica used in the mask at λ.

3. A method as defined in claim 2 in which the surface relief pattern in cross-section is a square-wave.

4. A method as defined in claim 2 in which the surface relief pattern in cross-section is a sine wave.

5. A method as defined in claim 1 in which the light beam is an ultraviolet light beam.

6. A method as defined in claim 5 in which the light beam is a laser beam.

7. A method as defined in claim 1 in which the light beam is provided by a KrF excimer laser.

8. A method as defined in claim 1 in which the optical medium is an optical fiber.

9. A method as defined in claim 8 in which striations of the phase mask grating are oriented orthogonal to or nearly orthogonal to the axis of the fiber.

10. A method as defined in claim 8 in which striations of the phase mask grating are oriented at an angle to the axis of the fiber.

11. A method as defined in claim 9 in which the light beam is provided by a KrF excimer laser.

12. A method as defined in claim 11 in which the mask has a surface relief pattern selected to modulate by approximately $\pi+2\pi n$ n=0,1,2,3, radians the phase of the light beam, wherein

$$\frac{4\pi(n_{silica}-1)A}{\lambda}=\pi+2\pi n$$

n=0,1,2,3 where A is the amplitude of the surface relief pattern, λ is the wavelength of the light and n_{silica} is the refractive index of the silica material used to make the mask at λ.

13. A method as defined in claim 12 in which the surface relief pattern in cross-section is a square-wave.

14. A method as defined in claim 13, in which a large dimension of the light beam cross-section is oriented parallel to striations of the phase mask grating.

15. A method as defined in claim [8] 10 in which the striations are chirped.

16. A method as defined in claim 9 in which the striations are chirped.

17. A method as defined in claim 9 in which the phase mask contains variations in either or both of pitch and amplitude of the striations.

18. A method as defined in claim 11 in which the light beam is an ultraviolet beam.

19. A method as defined in claim 1 including locating a refracting lens between the mask and the optical medium prior to applying the light beam.

20. A method as defined in claim 19 including placing an opaque blocking means for the zero order light beam between the mask and the lens prior to applying the light beam.

21. A method as defined in claim 19 including placing opaque blocking means for the zero and second order light beams between the mask and the lens prior to applying the light beam.

22. A method as defined in claim 1 further including a spatial amplitude light filter for shaping the beam profile prior to passing through the phase grating.

23. A method as defined in claim 22 in which the filter is coated on a face of the mask opposite to a face containing the phase grating.

24. A method as defined in claim 2, then repeatedly moving one of the mask and medium relative to the other a distance corresponding to the fringe pattern and applying said collimating light beam through the mask to said medium, such that subsequent photoimprinted gratings reflect in phase with previously photoimprinted gratings.

25. A grating mask comprising a slab of silica glass having parallel corrugations on a surface thereof form-

ing a surface relief pattern, the pattern containing variations in at least one of pitch and amplitude of the corrugations.

26. A grating means comprising a slab of silica glass having parallel corrugations on a surface thereof forming a surface relief pattern, including a spacial amplitude light filter coated on a surface of the slab opposite to the surface carrying said pattern.

27. A grating as defined in claim 25 further including a spacial amplitude light filter coated on a surface of the slab opposite to the surface carrying said pattern.

28. A grating means comprising a slab of silica glass having parallel corrugations on a surface thereof forming a surface relief pattern, in which the corrugation are filled with transparent material having an index of refraction different from that of the silica glass.

29. A grating as defined in claim 28 in which the transparent material is comprised of glass.

* * * * *

30. A method of fabricating Bragg gratings in the interior of an optical waveguide comprising disposing a silica glass phase grating mask adjacent and parallel to a photosensitive optical waveguide and applying a single collimating light beam through the phase grating to said optical waveguide as a medium, said phase grating mask being a slab of silica glass having parallel corrugations on a surface thereof forming a surface relief pattern.

31. A method according to claim 30, wherein the surface relief pattern contains variations in at least one of pitch and amplitude of the corrugations.

32. A method of fabricating Bragg gratings in the interior of an optical waveguide comprising disposing a silica glass phase grating mask adjacent and parallel to a photosensitive optical waveguide and applying a single collimating light beam through the phase grating mask to said optical waveguide as a medium, wherein the phase grating mask is configured so as to substantially suppress at at least one portion thereof a zero-order diffracted light beam of the light beam which passes through the phase grating mask.

33. A method according to claim 32, wherein the zero-order diffracted light beam is suppressed to less than 5% of the light diffracted by the phase grating mask.

34. A method according to claim 32, wherein plus one and minus one orders of the diffracted light beam are utilized for fabricating the Bragg gratings in the interior of the optical waveguide.

35. A method according to claim 32, wherein the Bragg gratings are substantially permanently fabricated in the interior of the optical waveguide.

36. A method according to claim 35, wherein the optical waveguide is an optical fiber.

37. A method according to claim 32, wherein the phase grating mask is configured so as to induce different phase in at least two adjacent portions of the light beam which passes through the phase grating mask.

38. A method according to claim 32, wherein the phase grating mask has a surface relief pattern formed thereon.

39. A method according to claim 38, in which the surface relief pattern in cross-section is a square-wave.

40. A method according to claim 38, in which the surface relief pattern in cross-section is a sine wave.

41. A method according to claim 38, wherein the phase grating mask has the surface relief pattern selected to modulate by approximately $\pi+2$ radians the phase of the light beam, wherein

$$\frac{4\pi(n_{silica}-1)A}{\lambda} = +2\pi n$$

a

where A is the amplitude of the surface relief pattern, $n = 0,1,2,3$, λ is the wavelength of the light used for writing (photoinducing) an index change in the optical medium and n_{silica} is the refractive index of the silica used in the mask at λ.

add a1

Add E1

Add D1